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EXAMINER	
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte J. RODNEY WALTON and MARK S. WALLACE

Appeal 2015-001919
Application 12/271,836[1]
Technology Center 2600

Before THU A. DANG, ERIC S. FRAHM, and
JAMES W. DEJMEK, *Administrative Patent Judges.*

DEJMEK, *Administrative Patent Judge.*

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134(a) from a Final Rejection of claims 1–23. We have jurisdiction over the pending claims under 35 U.S.C. § 6(b).

We reverse.

[1] Appellants identify QUALCOMM Incorporated as the real party in interest. App. Br. 4.

STATEMENT OF THE CASE

Introduction

Appellants' claimed invention is directed to "detecting and demodulating a signal/transmission in poor channel conditions." Spec. ¶ 7. In a disclosed embodiment,

> the timing of the input samples is adjusted (e.g., with a polyphase filter) to obtain timing-adjusted samples. A frequency offset is estimated and removed from the timing-adjusted samples to obtain frequency-corrected samples, which are processed with a channel estimate (e.g., using a rake receiver) to obtain detected symbols. The phases of the detected symbols are corrected to obtain phase-corrected symbols.

Spec. ¶ 9.

Claim 1 is illustrative of the subject matter on appeal and is reproduced below with the disputed limitation emphasized in *italics*:

> 1. An apparatus comprising:
>
> a processor operative to remove a frequency offset in input samples to obtain frequency-corrected samples, *to process the frequency-corrected samples with a channel estimate to obtain detected symbols, to correct phases of the detected symbols to obtain phase-corrected symbols*, and to perform demodulation on the phase-corrected symbols to obtain demodulated symbols; and
>
> a memory coupled to the processor.

The Examiner's Rejections

1. Claims 1, 4, 9, 10, 12, 13, 15–17, 19–21, and 23 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Saed (US 2005/0058193 A1; Mar. 17, 2005). Final Act. 6–7.

2. Claims 1–19 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Hartmann et al. (US 2005/0089115 A1; Apr. 28, 2005)

("Hartmann") and Stott et al. (US 6,628,730 B1; Sept. 30, 2003) ("Stott"). Final Act. 8–19.

3. Claims 20–23 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Hartmann, Stott, and Holtzman (US 6,393,257 B1; May 21, 2002). Final Act. 19–23.

Issues on Appeal

1. Did the Examiner err in finding Saed discloses processing frequency-corrected samples with a channel estimate to obtain detected symbols and correcting phases of the detected symbols to obtain phase-corrected symbols, as recited in claim 1?[2]

2. Did the Examiner err in finding the combination of Hartmann and Stott teaches or suggests processing frequency-corrected samples with a channel estimate to obtain detected symbols and correcting phases of the detected symbols to obtain phase-corrected symbols, as recited in claim 1?[3]

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[2] We only address this issue, which is dispositive of the Examiner's rejection under 35 U.S.C. § 102(e). We do not address additional issues raised by Appellants' arguments related to this rejection.

[3] We only address this issue, which is dispositive of the Examiner's rejections under 35 U.S.C. § 103(a). We do not address additional issues raised by Appellants' arguments related to these rejections.

ANALYSIS[4]

Rejection under 35 U.S.C. § 102(e)

Claim 1 recites, *inter alia*, processing frequency-corrected samples with a channel estimate to obtain detected symbols and correcting the phases of the detected symbols to obtain phase corrected symbols.

Appellants argue Saed does not disclose processing frequency-corrected symbols with a channel estimate to obtain detected symbols. App. Br. 10–11; Reply Br. 3. Further, Appellants contend Saed discloses "the complete opposite of claim 1" in that Saed processes data symbols with a channel estimate to obtain frequency compensated symbols rather than processing already frequency-corrected samples with a channel estimate to obtain detected symbols. App. Br. 11. Additionally, Appellants contend Saed fails to disclose correcting the phase of the detected symbols to obtain phase-corrected symbols. App. Br. 11–12; Reply Br. 4.

In response, the Examiner relies on Figure 4 of Saed and the accompanying text. Ans. 23–25. Figure 4 of Saed is reproduced below:

[4] Throughout this Decision, we have considered the Appeal Brief, filed June 2, 2014 ("App. Br."); the Reply Brief, filed November 24, 2014 ("Reply Br."); the Examiner's Answer, mailed September 24, 2014 ("Ans."); and the Final Office Action, mailed January 14, 2014 ("Final Act."), from which this Appeal is taken.

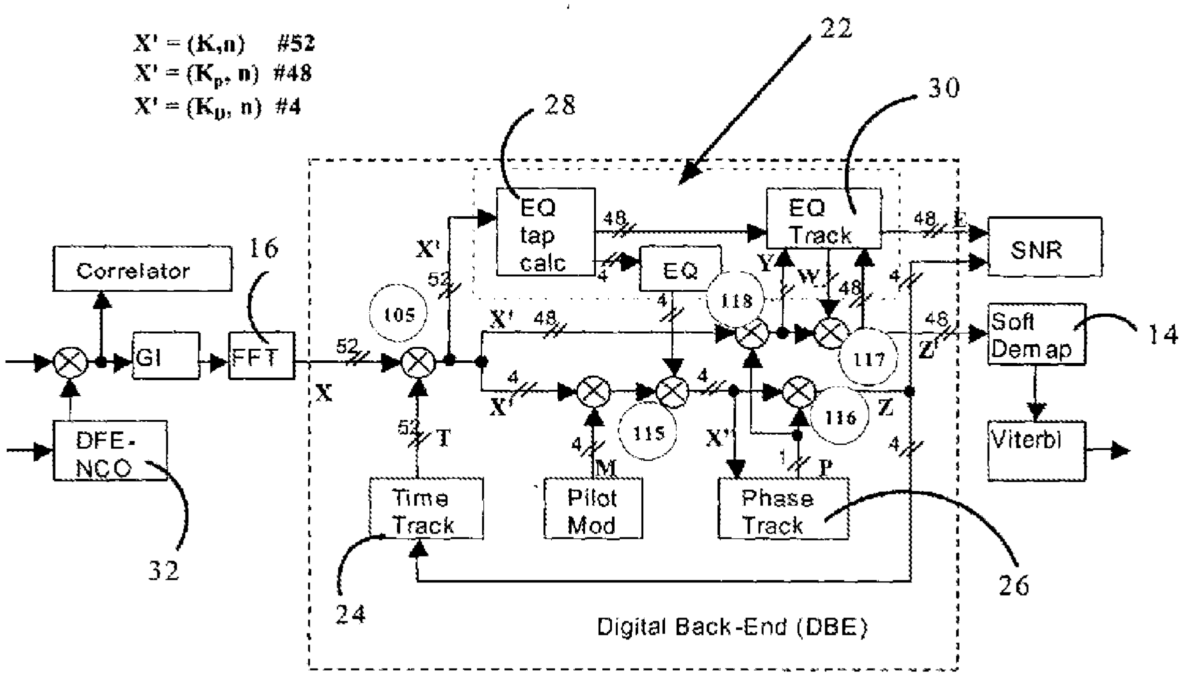

FIGURE 4

Figure 4 is a block diagram of Saed's digital demodulator back-end. Saed ¶¶ 24, 33.

The Examiner finds Saed discloses removing a frequency offset in input symbols (output from FFT (16), denoted X) by Time Track (24) to obtain frequency-corrected samples (denoted X′). Ans. 24. Further, the Examiner finds Saed discloses processing the frequency-corrected samples with a channel estimate (22) to obtain detected symbols. Ans. 25. The Examiner also finds Saed discloses correcting phases of the detected symbols to obtain phase-corrected symbols as illustrated by the X″ signal at the input to Phase Track 26 and P at the output of Phase Track 26. Ans. 25. As discussed *infra*, the Examiner's findings are not supported by Saed.

As an initial matter, we note Figure 4 of Saed contains several labeling errors. In identifying the various time-corrected subcarriers, X′,

Figure 4 of Saed switches the number of data subcarriers with the number of pilot subcarriers. In other words, Figure 4 should indicate $X' = (K_p, n)$ # 4 for pilot carriers and $X' = (K_D, n)$ # 48 for data carriers. *See* Saed ¶¶ 42, 61–64. Additionally, the points identified as 117 and 118 should be swapped. According to the Specification of Saed, at what should be labeled 117 (not 118), a phase correction is applied to the data carriers. Saed ¶ 63. The phase-corrected data carrier is represented as $Y(K_D, n) = X'(K_D, n)P(n)$. Saed ¶ 63. Further, at what should be labeled 118 (not 117), equalization is applied to the phase-corrected data carrier. Saed ¶ 64. The equalized, phase-corrected data carrier is represented as $Z(K_D, n)=Y(K_D, n)W(K_D, n)$. Saed ¶ 64.

Contrary to the Examiner's findings, $X''(K_p, n)$ represents demodulated pilot carriers that have further been equalized (i.e., $X''(K_p, n) = X'(K_p, n)M(K_p, n)W(K_p, n)$). Saed ¶ 61. The demodulated, equalized pilot carriers are used by the phase tracking circuit (26) to correct for residual carrier frequency offset by tracking phase error (i.e., rotation of the symbol constellation). Saed ¶ 39, Fig. 8a. The output of Phase Track (26) is a phase correction function P(n). Saed ¶ 39, Fig. 8a. Accordingly, to phase-correct the data subcarriers, the phase correction function P(n) is applied to the data subcarriers as represented by **Y**, incorrectly identified as 118 in Figure 4 of Saed. *See* Saed ¶ 63. However, these data subcarriers, $X'(K_D, n)$ have not been processed with a channel estimate (EQ Tap Calculation (28) and EQ Track (30)) and, therefore, do not correspond to the claimed detected symbols. *See also* Saed ¶¶ 35–37, Figs. 5, 6 (generally discussing the relationship of the equalization tap calculation and the channel estimate).

For the reasons discussed *supra*, we are persuaded of Examiner error. Accordingly, we do not sustain the Examiner's rejection under 35 U.S.C. § 102(e) of independent claim 1. For similar reasons, we do not sustain the Examiner's rejection under 35 U.S.C. § 102(e) of independent claims 12, 16, and 20, which recite similar limitations. Further, we do not sustain the Examiner's rejection under 35 U.S.C. § 102(e) of claims 4, 9, 10, 13, 15, 17, 19, 21, and 23, which depend therefrom.

Rejections under 35 U.S.C. § 103(a)

In rejecting claim 1, the Examiner finds Hartmann teaches, *inter alia*, processing frequency-corrected samples with a channel estimate to obtain detected symbols and further correcting the phase of the detected symbols to obtain phase-corrected symbols. Final Act. 8–9 (citing Hartmann ¶¶ 15, 51, Fig. 2).

Appellants contend Hartmann performs the frequency and phase correction on a received signal vector in order to detect the received data. App. Br. 13; Reply Br. 6. Appellants argue Hartmann teaches the opposite of what is recited in claim 1 because the phase correction in Hartmann "is performed in order to *obtain the detected symbols*, not to correct the phases of the *already detected symbols*." App. Br. 13.

Figure 2 of Hartmann is illustrative and is reproduced below:

FIG 2

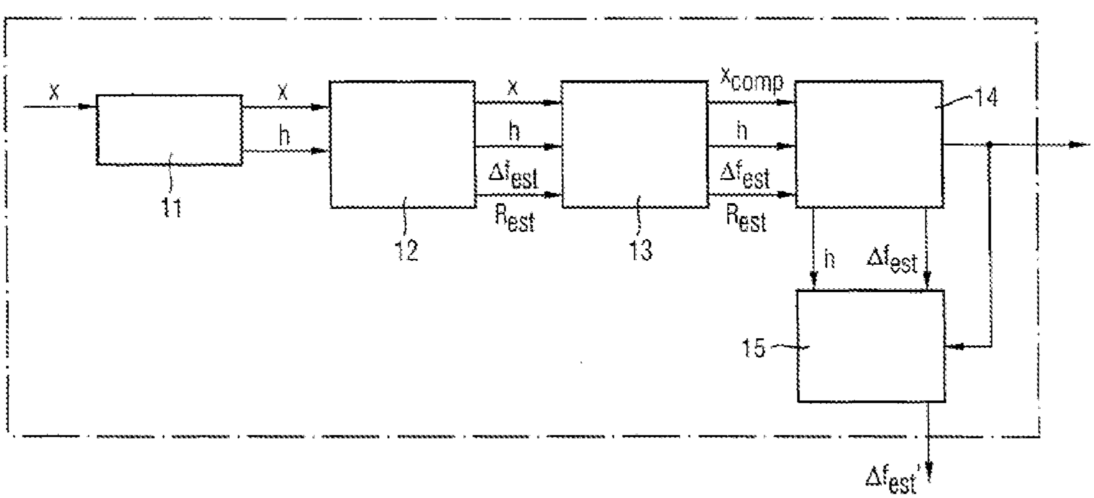

Figure 2 of Hartmann is a block diagram of a receiving unit. Hartmann ¶ 46. Hartmann teaches a received signal vector is input to a channel estimator (11) to determine channel coefficients (h) for the channel estimate. Hartmann ¶ 51. Further, the received data and the channel coefficients are transferred to a frequency offset unit (12), before equalization, to determine a compensation value for a frequency offset (Δf_{est}). Hartmann ¶ 51. Block 13 is a frequency offset compensation unit which applies the frequency and phase correction to the received data, resulting in frequency-corrected or phase-corrected elements (i.e., symbols), x_{comp}. Hartmann ¶ 51. Additionally, Hartmann teaches "a channel equalizer **14**, which detects the received data from the phase-corrected sample values of the received signal vector x_{comp}." Hartmann ¶ 51. Hartmann also teaches estimation unit (15) determines refined frequency offset estimate ($\Delta f_{est}'$), which is estimated after equalization, and/or a change in the phase of the transmission channel over time. Hartmann ¶ 52. Hartmann teaches the refined frequency offset "is used, for example, for frequency correction of subsequent received data bursts." Hartmann ¶ 52.

The Examiner finds Hartmann processes frequency-corrected symbols (i.e., the output of Frequency Offset Compensation Unit (13)) with a channel estimate to obtain detected symbols (i.e., the output of Channel Equalizer (14)). Ans. 30. Further, the Examiner finds Hartmann teaches correcting the phases of the detected symbols to obtain phase-corrected symbols (i.e., the output of Estimation Unit (15)). Ans. 30.

As set forth above, the output of the Estimation Unit is a refined frequency offset compensation value ($\Delta f_{est}'$), not phase-corrected symbols. Hartmann ¶ 52. Further, we agree with Appellants' argument that Hartmann teaches using phase correction to obtain the detected symbols rather than phase correcting already detected symbols, as claimed. The Examiner does not provide sufficient technical explanation or reasoning to rebut Appellants' argument.

For the reasons discussed *supra*, we are persuaded of Examiner error. Accordingly, we do not sustain the Examiner's rejection under 35 U.S.C. § 103(a) of independent claim 1. For similar reasons, we do not sustain the Examiner's rejections under 35 U.S.C. § 103(a) of independent claims 12, 16, and 20, which recite similar limitations. Further, we do not sustain the Examiner's rejections under 35 U.S.C. § 103(a) of claims 2–11, 13–15, 17–19, and 21–23.

DECISION

We reverse the Examiner's decision to reject claims 1, 4, 9, 10, 12, 13, 15–17, 19–21, and 23 under 35 U.S.C. § 102(e).

We reverse the Examiner's decision to reject claims 1–23 under 35 U.S.C. § 103(a).

REVERSED